

APPENDIX C
Transportation Management Study

Transportation

Overview

The analysis of existing conditions is an important step in the planning of transportation facilities for the future. All of the future traffic projections and analysis use the existing conditions as a baseline for the formulation of plan recommendations. This section reports the existing conditions on the North Post of Fort Belvoir, which includes the closure of Woodlawn Road and Beulah Street to the public. Due to public concerns, Fort Belvoir is partnering with Virginia Department of Transportation (VDOT) and Fairfax County to permit limited public access to these roads while maintaining required security for the installation.

Regional Highway Network

Fort Belvoir is located outside of Washington D.C. in Fairfax County, Virginia. U.S. Route 1 dissects the base into the North Post and the South Post. Access to the North Post can be attained in several ways. Route 1 provides access to the North Post via the Lieber Gate and Woodlawn Road Gate. However, the Lieber Gate has been permanently closed due to increased security measures on the base. Access can be attained from Interstate 95 via the Fairfax County Parkway and the John J. Kingman Road Gate. Traffic can also gain access to the North Post from the South Post via Gunston Road. The Woodlawn Gate has limited hours during the week, and is closed on the weekends. Therefore the primary access for the North Post on the weekends is the John J. Kingman Road Gate and Gunston Road via Pence Gate. During the week, the main access is projected to be split between the John J. Kingman Road Gate and Woodlawn Road Gate. The surrounding roadway network is comprised of roads under the jurisdiction of VDOT and Fairfax County.

Gate Access

The North Post of Fort Belvoir can be accessed from all directions. Until recently the general public was able to travel through the post. During the week the baseline traffic counts were taken, the post was experiencing a higher level of security than in the past. Due to the events of September 11, 2001 the post security was elevated to Force Protection Condition (FPCON) Charlie. As the level of security changes the number of access points to the post will change. During the week of December 3rd, 2001 there were only three access points to the North Post. A temporary gate was setup on John J. Kingman Road west of Beulah Street. Another temporary gate was setup on Woodlawn Road to the North of Route 1 (Richmond Highway). Access to the North Post could also be attained from the South Post via Gunston Road. All other access points to the installation were closed. It was assumed that these conditions would continue into the future.

Study Area

This project area includes the North Post of Fort Belvoir as well as several intersections outside the post. The interchange of Telegraph Road and the Fairfax County Parkway is included in the analysis. The intersection of Route 1 and the Fairfax County Parkway is also included in the analysis. The Telegraph Road and Beulah Street intersection was also included in the study, although access to the base via Beulah Street was closed due to increased security on the post. The study area was determined with coordination between Fort Belvoir, VDOT, and the National Capital Planning Commission (NCPC).

Traffic Control

Traffic control on-post is attained primarily through the use of traffic signals at roadway intersections. Of the four on-post intersections that were analyzed, three were signalized and one was unsignalized. The signalized intersection studied were Beulah Street and John J. Kingman Road; Gunston Road and John J. Kingman Road; and Gorgas Road and Woodlawn Road. The unsignalized intersection was Gunston Road and Gorgas Road.

The off-post intersections included in this study are all signalized. The intersections analyzed are Woodlawn Road (Route 618) and Route 1; Beulah Street and Telegraph Road; Fairfax County Parkway and Route 1; and the Fairfax County Parkway interchange with Telegraph Road. VDOT provided the counts for each of these intersections except for Route 1 and Woodlawn Road.

Existing Traffic Volumes

Twenty-four hour line counts were taken the week of December 3, 2001. These counts were taken on John J. Kingman, Gorgas Road, Gunston Road, Woodlawn Road, the Fairfax County Parkway/Telegraph Road interchange, and Pohick Road. Figure 14 shows the 24-hour line count locations for this study. Traffic volumes varied from 711 to 10,130 vehicles per day in one direction. The volumes counted during this study are shown in Table 4. Classification counts were taken at the first five locations. Therefore, truck percentages are shown for these locations.

Table 4. Traffic Counts				
Site Number	Road Name	Direction	Volume (Vehicles per Day)	Truck Percentage
1	John J. Kingman Road	Eastbound	5,312	2
2	John J. Kingman Road	Westbound	711	2
3	Gunston Road	Northbound	4,504	8
4	Gorgas Road	Westbound	4,657	1
5	Gorgas Road	Westbound	2,178	3
6	Woodlawn Road	Northbound	3,512	5
7	Pohick Road	Northbound/ Southbound	10,854	—
8	Route 1 (Right Turn Lane)	Eastbound	5,065	—
9	Fairfax County Parkway/ Telegraph Road	Northbound Entrance Ramp	4,897	—
10	Fairfax County Parkway/ Telegraph Road	Northbound Exit Ramp	10,130	—
11	Fairfax County Parkway/ Telegraph Road	Southbound Entrance Ramp	4,953	—
12	Fairfax County Parkway/ Telegraph Road	Southbound Exit Ramp	Count Invalid due to Construction	—

Public Transportation

Various forms of public transportation exist in and around the Fort Belvoir area. These services range from bus services to light rail and even commuter rail. A summary of each of the services is listed below.

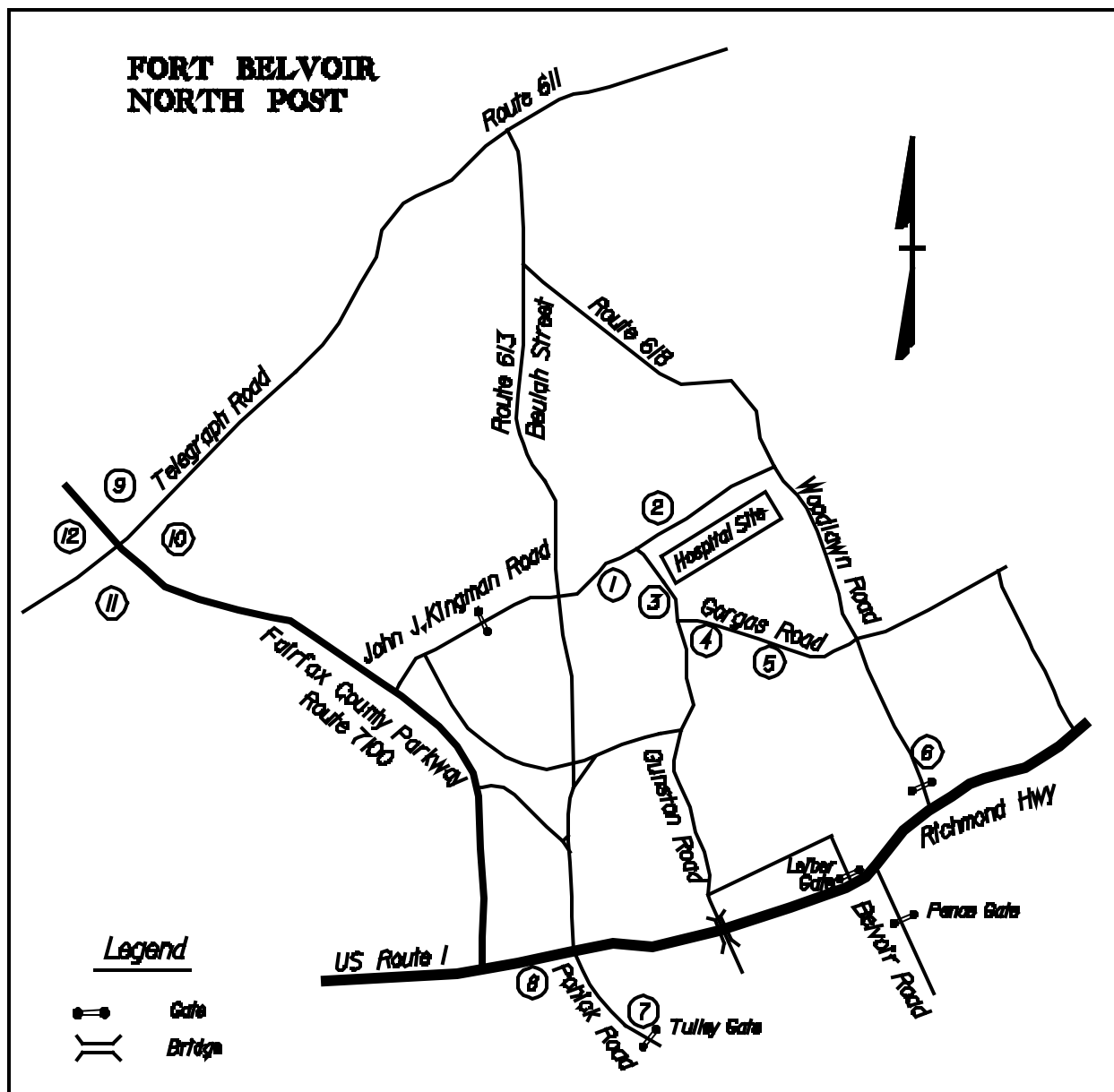


Figure 14—Count Locations

Commuter Rail

Commuters from outlying areas such as Fredricksburg, Stafford, and Quantico can take advantage of this service. Fredricksburg is approximately 50 miles to the south of Fort Belvoir and Quantico is about 30 miles to the south of Fort Belvoir. Two different providers are available to the public in this region, these are Amtrak and the Virginia Rail Express (VRE). The Amtrak line runs north from Fredricksburg, along the Potomac River, and into Union Station in the District of Columbia. The closest stop to Fort Belvoir is the Woodbridge Station about eight miles away. The Virginia Rail Express operates along the same corridor with more local stops. The Green Line runs from Manassas to Union Station and the Red Line from Fredricksburg to Union Station. Persons riding from Fredricksburg, Stafford, or Quantico can stop at the Lorton Station about 6 miles from the post. From either the Woodbridge, Lorton, or Franconia/Springfield Metro Stations, the riders would then need to use the local bus system for the remainder of their trip.

Light Rail

The Metro light rail system operates out of the Washington D.C. area to the outlying areas. The Blue Line ending at the Franconia-Springfield station or the Yellow Line at the Huntington Station has service to Fort Belvoir. The public from Alexandria or Arlington County can best be served by this mode and preferably using the Yellow Lines Huntington Station. From there, direct service to Fort Belvoir can be obtained by the Metrobus system. Users of the Blue Lines Franconia-Springfield Station would need to obtain bus service from that station to the Huntington Station and then from there to the Post.

Bus

There are several bus services in the Washington Metro area. Most serving and interconnecting the local communities in the Fairfax County region. Only two services provide direct access to Fort Belvoir, the Metrobus, and the Fairfax Connector. Other routes and services from areas such as Dumfries, Burke, and Woodbridge require a more local service to get to the other two providers.

Metrobus

Metrobus Route 9A provides several stops for Fort Belvoir. Those riders using AMTRAK or the VRE can debark at the Lorton Station and pick up this route to the post. Also, riders of the Metro can exit at the Huntington Station and take this route from the other direction. Arrivals and departures are about every hour from around 0600 till 2400.

Fairfax Connector

The Fairfax Connector Route 107 supports service along the length of Route 1 from the Huntington Metro Station at its northern end to the DLA Building at Fort Belvoir at its southern terminus. Service arrives every half-hour in the morning beginning at 0630 till 0930 and in the evening from 1702 till 1932. Service departs every about half hour in the morning beginning at 0500 till 0825 and in the evening from 1547 till 1818.

Route 202 of the Fairfax Connector provides access from the Franconia/Springfield Metro Station to several locations on Fort Belvoir. The same route connects to the Van Dorn Street Metro station as well. The VRE stops at the Franconia/Springfield Metro Station making this a

convenient mode of transportation for commuters outside the immediate vicinity of Fort Belvoir.

Fort Belvoir Shuttle

Fort Belvoir also offers a Post shuttle bus service between the hours of 0700 to 1900 daily. The service consists of a single bus that serves the entire route. The route provides access to the major work centers and other places of official business. The bus is for official use only.

Traffic Accident Analysis

Traffic accident data for the past three years was provided to Woolpert. There were a total of 133 reported vehicle accidents in and around the North Post of Fort Belvoir from January 1999 through December 2001. The highest percentage of these crashes occurred during the months of December through March.

Of the accidents studied 30.5 percent occurred at intersections on and off the post, 25.2 percent occurred in parking lots and 44.3 percent occurred on roadway links between intersections. Of the accidents that occurred in parking lots, the highest number occurred in the commissary parking lot which had 59.3 percent of the parking lot accidents. The PX parking lot had 33.3 percent of the parking lot accidents. Of the intersections with recorded accidents, the intersection of John J. Kingman Road and Fairfax County Parkway had the highest percentage of accidents with 37.50 percent. Twenty-five percent of the accidents occurring at intersection occurred at the intersection of Woodlawn Road (Route 618) and John J. Kingman Road.

Warrant Analysis

Only one intersection of those studied is currently unsignalized. This is the intersection of Gunston Road and Gorgas Road to the West of the commissary and PX. A warrant analysis based upon the criteria set forth in the Millennium Edition of the Manual on Uniform Traffic Control Devices was performed and the results are summarized below. As shown in Table 5, a traffic signal is not warranted at the intersection of Gunston Road and Gorgas Road.

Table 5. Traffic Signal Warrant Analysis (Gunston Road and Gorgas Road)			
Warrant #	Met	Not Met	Comments
1 (8 Hour Volume)		✓	Criteria not met.
2 (4 Hour Volume)		✓	Criteria not met.
3 (Peak Hour Volume)		✓	Criteria not met.
4 (Pedestrian Volume)		✓	No pedestrians were observed during traffic counts in both AM and PM peaks.
5 (School Crossing)		✓	No school children crossing street.
6 (Coordinated Signal System)		✓	No coordinated signal currently planned in study area.
7 (Crash Experience)		✓	Number of crashes does not meet criteria.
8 (Roadway Network)		✓	Not an intersection of two major roadways.

Capacity Analysis

Turning movements counts were taken the week of December 3, 2001. Capacity analyses for both the AM and PM peak periods were performed for these intersections. These analyses were performed using the SYNCHRO 4 traffic analysis software, as well as the Highway Capacity Software 2000 (HCS2000). The Highway Capacity Manual (HCM) defines the Levels of Service (LOS) based upon the amount of delay a driver experiences at an intersection. Table 6 shows the LOS criteria for the signalized intersections.

Table 6. Signalized Intersection LOS Criteria	
LOS	Control Delay per Vehicle (Seconds/Vehicle)
A	<10
B	>10 to 20
C	>20 to 35
D	>35 to 55
E	>55 to 80
F	>80

The LOS is calculated for each movement at an intersection. There is also an overall intersection LOS that is computed. Tables 7 through 15 give the movement as well as overall LOS for the AM and PM peak periods for the signalized intersections studied as part of this report.

The intersection operates at a LOS A in both the AM and PM peak periods, as shown in Table 7.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
AM Peak (LOS)	A	A	A	A	A	A
PM Peak (LOS)	B	A	A	A	B	A

The intersection operates at a LOS A in both the AM and PM peak periods, as shown in Table 8.

Movement	EBL	EBT	EBR	WBL	WBTR	NBTL	NBR	SBTL	SBR
AM Peak (LOS)	A	A	A	A	A	B	A	B	A
PM Peak (LOS)	A	A	A	A	A	B	A	B	A

The intersection operates at a LOS A in both the AM and PM peak periods, as shown in Table 9.

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The intersection operates at a LOS A during the AM Peak, and a LOS B during the PM peak, as shown in Table 10.

Table 10. Route 1 and Woodlawn Road						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
AM Peak (LOS)	A	A	B	A	C	A
PM Peak (LOS)	B	A	B	A	C	A

This intersection operates at a LOS C during the AM peak period, and at a LOS A during the PM peak period, as shown in Table 11.

Table 11. Beulah Street and Telegraph Road												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
AM Peak (LOS)	A	A	A	A	B	A	B	C	A	B	C	A
PM Peak (LOS)	A	B	A	A	B	A	B	C	A	B	C	B

This intersection operates at a LOS B during the AM peak period and at a LOS E during the PM peak period, see Table 12. The construction of westbound dual right turn lanes by VDOT will improve the LOS at this intersection.

Table 12. Fairfax County Parkway and Route 1						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
AM Peak (LOS)	A	C	B	A	D	A
PM Peak (LOS)	A	A	D	F	C	F

This intersection operates at a LOS B during the AM peak period and PM peak period, as shown in Table 13.

Table 13. Fairfax County Parkway and John J. Kingman Road											
Movement	EBL	EBT	EBR	WBL	WB TR	NBL	NBT	NBR	SBL	SBT	SBR
AM Peak (LOS)	C	C	A	C	C	B	A	A	A	C	A
PM Peak (LOS)	C	C	A	B	B	A	B	A	A	C	A

This intersection operates at a LOS F during the AM peak period and at a LOS E during the PM peak period, see Table 14. Telegraph Road was under construction during the study period. The LOS for the intersection should be reevaluated now that construction is complete.

Table 14. Fairfax County Parkway (Ramps A and B) and Telegraph Road						
Movement	EBL	EBT	WBT	WBR	NBTL	NBR
AM Peak (LOS)	A	F	A	A	C	A
PM Peak (LOS)	A	F	A	A	C	A

This intersection operates at a LOS A during the AM peak period and the PM peak period, see Table 15. Telegraph Road was under construction during the study period. The LOS for the intersection should be reevaluated now that construction is complete.

Table 15. Fairfax County Parkway (Ramps C and D) and Telegraph Road						
Movement	EBT	EBR	WBT	WBL	SBTL	SBR
AM Peak (LOS)	A	A	A	A	C	A
PM Peak (LOS)	A	A	A	A	C	A

Capacity analyses were also performed for the AM and PM peak periods for the unsignalized intersection. The HCM also defines the LOS criteria for All-Way Stop controlled intersections. Table 16 defines the criteria for the LOS for All-Way Stop controlled intersections based upon the average control delay per vehicle. A LOS is given for each traffic movement; no LOS is assigned to the whole intersection.

Table 16. LOS Criteria for All-Way Stop Controlled Intersections	
LOS	Control Delay (Seconds/Vehicle)
A	<10
B	>10 to 15
C	>15 to 25
D	>25 to 35
E	>35 to 50
F	>50

Table 17 shows the capacity analysis for the Gorgas and Gunston Roads intersection for both the AM and PM peak periods. All of the turning movements operate at a LOS C or better.

Table 17. Gorgas Road and Gunston Road						
Movement	WBL	WBR	NBT	NBR	SBT	SBL
AM Peak (LOS)	A	A	A	A	B	A
PM Peak (LOS)	B	B	C	B	B	B

Tables 7-17 show, for the most part, the intersections evaluated as part of this study operate at an acceptable LOS. The interchange between the Fairfax County Parkway and Telegraph Road should operate a LOS C or better after the construction is completed. It is currently completed however additional counts have not been included in this analysis. The intersection of Route 1 and Fairfax County Parkway operates at an unacceptable LOS E during the PM peak period.

Parking Considerations

Parking lots located at the PX and the commissary were observed on December 6th, 2001. The observations took place at 10:00 a.m. There are a total of 1,555 parking spaces in the area of the PX and commissary. Of the 1,555 spaces available for use 40.06 percent were being

occupied. The PX and the commissary have separate parking lots separated by an entrance street into the complex from Gorgas Road.

Table 18 shows the usage of each of the lots located at the PX and commissary.

Table 18. Parking Lot Analysis			
Location	Capacity	Used	Percentage Used
Commissary	650	300	46
PX	905	323	36
Reserved (Both PX and Commissary)	20	18	90
Handicapped (Both PX and Commissary)	16	5	31
Grand Totals	1,591	646	41

The commissary parking lot could further be subdivided into three distinct lots. Two of these lots are located to the south of the commissary, and one lot is located to the west of the commissary. The first lot located to the Southeast of the commissary was 57 percent occupied, the second lot which is located to the southwest of the commissary was 36 percent occupied, and the third lot located to the west of the commissary was 14 percent occupied.

Sign Inventory

A sign inventory of the PX and commissary parking areas was taken during the week of December 3rd, 2001. Sign height was not checked, but sign placement appears to meet MUTCD requirements.

Planned Future Improvements

There are several proposed projects currently planned that will increase traffic in the RCSC area. These improvements listed below. The additional vehicle trips per day were calculated based upon trip generation rates listed in Army Technical Manual TM 5-803-9. These rates were used to calculate the additional trips per day for the PX expansion and the proposed fast food restaurant, The Trip Generation Manual published by the Institute of Transportation Engineers was used to calculate the additional trips per day for the chapel, hospital, and MP station.

1. Dewitt Hospital Replacement – The hospital is proposed to be relocated to the RCSC area from the South Post. The proposed site is to the Northwest of the PX and in the Southeast quadrant of the intersection of Gunston Road and John J. Kingman Road. The proposed hospital will have an area of 320,000 square feet¹ and will generate approximately 5,250 additional vehicle trips per day, with an additional peak hour flow of 310 vehicles per hour (vph). We have assumed that 25 percent of those entering and exiting the site will be staff and will therefore proceed to the staff lot proposed for the east side of the site; 10 percent will come from the east, and 15 percent will come from the west. For the patients and visitors, 50 percent will come from the west along John J. Kingman Road, which provides direct access to Interstate 95 and Route 1 via the Fairfax County Parkway. The remainder will come north on Gunston Road and turn right into the patient lot. Of the remainder, 10 percent will come from Gorgas Road and the remaining 15 percent will come from Gunston Road.

¹ Recent changes to hospital size are addressed in Chapter Four.

2. PX Expansion – This project would almost double the size of the PX from 138,000 square feet to a total of 275,000 square feet. An additional 9,590 vehicle trips per day will be generated by the expansion. An additional peak flow of 274 vehicles will be generated. These trip rates are base upon the rates listed in TM 5-803-9. An increase of 70-120 vehicle trips per day for every 1000 square feet increase in area can be expected. Since the additional space is to be utilized for the sale of durable goods, seasonal items, and a small military clothing operation the lower rate was used in the calculations.
3. Chapel – This project will have an area of 20,159 square feet. This improvement to the post will produce an additional 200 trips per day.
4. Police Station – This facility is located on Abbot Road. It is estimated that it will generate an additional 200 vehicle trips per day.
5. Soldier Support Center – This project will be 68,728 square feet in size. This facility would not attract many outside trips from the post onto the post. In other words, this facility would not attract people who were not coming onto the post anyway. Therefore, it was assumed that the facility would generate a small number of trips per day in the vicinity of 200 trips per day.
6. Fast Food Restaurant – This improvement will be located along the south side of Gorgas Road. This will produce an additional 2,000 vehicle trips per day, with an additional 160 vehicles per hour during the peak hour. The number of additional trips is based on an average sized fast food restaurant.

The VDOT also currently has a plan to widen Meeres Road from a two-lane roadway to a four-lane roadway until the intersection with Route 618 (Woodlawn Road).

Transportation Management Plan

Model Calibration

Modeling Background

Woolpert was provided with the Metropolitan Washington Council of Government's (MWCOG) Version 1 travel demand model for the design years of 2001, 2005, and 2020. This is a traditional four-step urban transportation model, which uses trip generation, trip distribution, modal choice, and trip assignment. The purpose of trip generation estimation is to determine the number of trips to and from activities in an analysis area based upon factors such as automobile ownership, income, household size, availability of public transportation, density of development, and the quality of the transportation system. This information was provided by MWCOG. Trip distribution is the process by which trips from one zone are connected with trips from another zone in the model area. Trip distribution links the attractions from one zone to the productions of another zone. Modal choice is the determination of what percentages of trips will be made using the different modes of travel available. These modes include all modes in the public transportation system as well as a private automobile. Trip assignment is the process by which future traffic volumes can be simulated on a transportation system. The MWCOG model contains 2191 traffic analysis zones which are divided up into 487 traffic analysis districts. The model network covers a wide area from as far South as Spotsylvania County, Virginia to the city limits of Baltimore, Maryland and as Far West as Jefferson County, West Virginia. The modeled area is shown below in Figure 17.

Several changes to the network provided by MWCOG were necessary in order to correctly calibrate the model to the conditions that were present when traffic counts were performed.

Several links were coded to prohibit all traffic, these included Woodlawn Road North of John J. Kingman road, and Beulah Street south of Telegraph Road. These links were closed to through

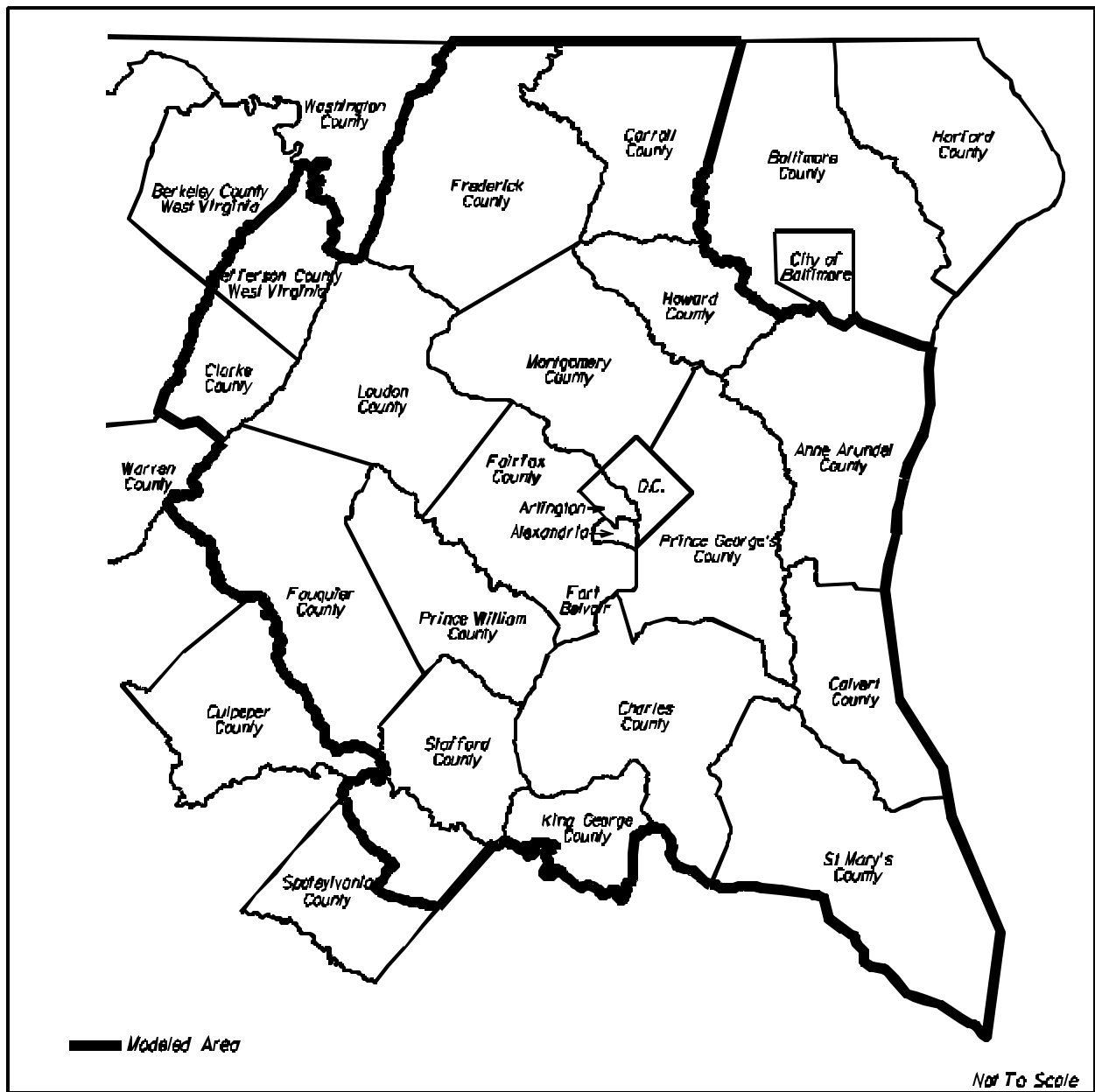


Figure 17—Modeled Area

traffic when counts were performed the week of December 3rd, 2001. Several links and nodes were also added to the network for calibration purposes. A link for John J. Kingman Road from the Fairfax County Parkway to Beulah Street was added. Gunston Road was also added connecting from John J. Kingman road to the South Post. Gorgas Road was also added connecting from Woodlawn Road to Gunston Road. Centroid connectors were also modified on both the North and South Posts of Fort Belvoir. Turning penalties were also applied to several intersections in order to reduce the number of vehicles accessing the Fort Belvoir roadway network. In the past the public has been allowed to travel through Fort Belvoir to gain access to Route 1, the Fairfax County Parkway, and Telegraph Road. When the traffic counts were performed, the installation had been closed to the general public due to increased security measures, which stemmed from the terrorist attacks on September 11, 2001. Penalties were applied at the following intersections: Woodlawn Road and Route 1, John J. Kingman Road and The Fairfax County Parkway. The purpose of these penalties is to force vehicles to take alternate routes around the post instead of traveling through the post.

Validation of the traffic model was accomplished by comparing the ground counts taken in the field with the link volumes from the model. The difference between the ground counts and the simulated counts should be such that it will not affect the number of lanes required to handle any future projected volumes. Figure 18 was taken from "Calibration and Adjustment of System Planning Models" which is published by the U.S. Department of Transportation Federal Highway Administration and dated December 1990. As is shown in Figure 18, the amount of deviation allowed increases as the volume of vehicles on the road decreases.

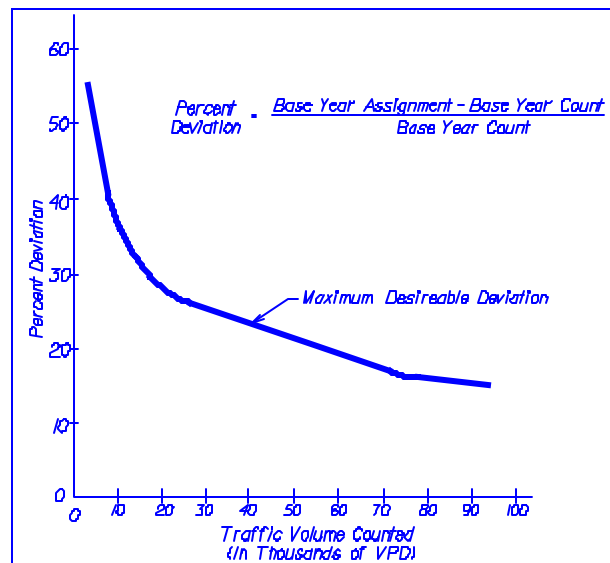


Table 24 lists the volumes that were assigned to the links on the North Post and the percent deviation calculated based upon the counted volumes.

Table 24. Model Calibration Results			
Roadway	Counted	Modeled Assignment	% Deviation
John J. Kingman Road Eastbound	5312 VPD	4987 VPD	6.11%
John J. Kingman Road Westbound	711 VPD	2437 VPD	242% ¹
Gunston Road Northbound	4504 VPD	6930 VPD	53% ¹
Gorgas Road Westbound	4657 VPD	5423 VPD	16.44%
Woodlawn Road Northbound	3512 VPD	2924 VPD	16.74%

¹Due to the low volumes, a higher percentage of deviation is acceptable since it will not affect the number of lanes needed to carry the modeled traffic.

Opening Day Conditions

MWCOG provided Woolpert with data for modeling traffic demand for the year 2005. Changes to the network were necessary to correctly model the traffic flow. These changes are listed above in the Model Calibration section of this report. An average growth factor of 3.5 percent was calculated for every year until the year 2005 based upon the model output. This growth factor was assumed to stay constant for the next two years until the hospital is projected to

open in the year 2007. The new traffic that will be generated by the proposed DeWitt Army Community Hospital and other improvements to the post was then added on top of the background traffic to obtain the design 2007 traffic. Table 25 shows the Average Daily Traffic (ADT) for the opening day conditions.

Table 25. Year 2007 Average Daily Traffic				
Site Number	Road Name	Direction	Volume (Vehicles per Day)	Truck %
1	John J. Kingman Road	Eastbound	12,128	2
2	John J. Kingman Road	Westbound	1,662	2
3	Gunston Road	Northbound	10,740	8
4	Gorgas Road	Westbound	9,616	1
5	Gorgas Road	Westbound	5,035	3
6	Woodlawn Road	Northbound	7,331	5
7	Pohick Road	Northbound/ Southbound	13,342	—
8	Route 1 (Right Turn Lane)	Eastbound	6,226	—
9	Fairfax County Parkway/ Telegraph Road	Northbound Entrance Ramp	6,020	—
10	Fairfax County Parkway/ Telegraph Road	Northbound Exit Ramp	12,452	—
11	Fairfax County Parkway/ Telegraph Road	Southbound Entrance Ramp	6,089	—

These volumes do not take into account any future improvements to the North Post. They are simply the existing traffic grown at a rate of 3.5 percent per year until the year 2007. The following capacity analyses do take into account future traffic generated by other project on the post.

Warrant Analysis

A warrant analysis for the intersection of Gorgas Road and Gunston Road was performed for the year 2007 traffic. Table 26 summarizes the results of the analysis.

Table 26. Warrant Analysis Gorgas Road and Gunston Road			
Warrant #	Met	Not Met	Remarks
1. Eight-Hour Vehicular Volume		√	
2. Four-hour Vehicular Volume		√	
3. Peak Hour	√		
4. Pedestrian Volume		√	No pedestrians were observed during traffic counts in both AM and PM peaks.
5. School Crossing		√	No school children crossing street.
6. Coordinated Signal System		√	No coordinated signal currently planned in study area.
7. Crash Experience		√	Number of crashes does not meet criteria.
8. Roadway Network	√		Two major roadways in the future.

A traffic signal is normally warranted if one of the major warrants (1 through 3) is satisfied or if 2 or more of the minor warrants (4 through 8) are satisfied. A traffic signal will be warranted at this intersection in 2007 due to the new traffic generated by the improvements to the North Post. Capacity analyses for this intersection in the future were done as a signalized intersection.

Capacity Analysis

Capacity analyses were also performed for the design year 2007 conditions. The results of these analyses are listed in the tables below.

Additional traffic was added to this intersection due to the developments on the North Post including the Dewitt Army Hospital. This intersection is predicted to operate at a LOS A during the PM peak and at a LOS B during the PM peak of 2007 (see Table27).

Table27. John J. Kingman Road and Gunston Road (2007)						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
AM Peak (LOS)	C	A	B	B	B	A
PM Peak (LOS)	C	A	B	B	B	A

The additional traffic generated by improvements to the post was added to the through movements on John J. Kingman Road. It was assumed that 65 percent of all traffic generated would be coming from the west of the post, and would leave to the west of the post. This intersection is predicted to operate at a LOS A during the AM peak and at a LOS B during the PM peak of 2007 (see Table28).

Table28. John J. Kingman Road and Beulah Street (2007)									
Movement	EBL	EBT	EBR	WBL	WB TR	NB TL	NBR	SB TL	SBR
AM Peak (LOS)	A	B	A	A	B	C	A	B	A
PM Peak (LOS)	A	B	A	A	A	C	B	C	B

This intersection will warrant a traffic signal in the design year of 2007. Therefore, the future capacity analysis was performed as if the intersection was signalized. This intersection is predicted to operate at a LOS A during the AM peak and at a LOS B during the PM peak of 2007 (see Table29).

Table29. Gorgas Road and Gunston Road (2007)						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
AM Peak (LOS)	B	A	A	A	A	A
PM Peak (LOS)	C	A	A	A	B	A

This intersection is predicted to operate at a LOS B during the AM peak and at a LOS A during the PM peak of the design year 2007 (see Table30). Additional traffic has been added to the Northbound through and left turn movements, as well as the Southbound through and Westbound right movements for the additional trips generated by the proposed improvements to the post. It was assumed the 35 percent of the incoming traffic would enter the post at the Woodlawn Road gate and travel through this intersection.

Table30. Woodlawn Road and Gorqas Road (2007)										
Movement	EB TL	EBR	WB TL	WBR	NBL	NBT	NBR	SBL	SBT	SBR
AM Peak (LOS)	B	A	C	A	A	A	A	C	B	A
PM Peak (LOS)	B	A	B	A	A	A	A	A	B	A

This intersection is predicted to operate at a LOS C during the AM peak and at a LOS D during the PM peak of 2007 (see Table31). The additional traffic entering and exiting the post at this intersection was distributed according to the current traffic distribution. Current VDOT plans include the widening of Route 1 to a six-lane section, which should decrease the delay for the westbound through movement. This improvement will also decrease the delay for the eastbound left movements, since it will be possible to make the phase servicing this movement longer. Dual left turn lanes should be considered for the southbound left movements. This improvement is necessary due to external traffic growth and is not related to the proposed developments on the North Post. VDOT's Road Design Manual, Volume 1 states that dual left turn lanes are desirable where peak left-turn movements exceed 350 vph. The southbound left turn movement is predicted to have a demand of 432 vph in 2007.

Table31. Woodlawn Road and Route 1 (2007)						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
AM Peak (LOS)	F	C	D	A	D	A
PM Peak (LOS)	F	B	D	A	F	C

External intersections were also analyzed for capacity in 2007. The traffic at these intersections was also assumed to grow at a rate of 3.5 percent per year until 2007. The traffic entering the post from the west and the east was distributed at these intersections according to the current traffic distribution.

This intersection is predicted to operate at a LOS D during the AM peak and at a LOS E during the PM peak of 2007 (see Table32). The additional traffic entering and exiting the post to the west was added to this intersection. Providing an additional eastbound right turn lane will increase the LOS for the intersection to a LOS C during the PM peak. This improvement can also increase the LOS for the westbound left movement, since more of the cycle length could be given to this movement.

Table32. John J. Kingman Road and Fairfax County Parkway (2007)											
Movement	EBL	EBT	EBR	WBL	WB TR	NBL	NBT	NBR	SBL	SBT	SBR
AM Peak (LOS)	D	D	A	F	D	E	B	A	B	E	A
PM Peak (LOS)	B	C	F	B	A	A	C	A	A	F	A

This intersection is predicted to operate at a LOS E during the AM peak and at a LOS F during the PM peak of 2007 (see Table33). Additional traffic was added to the Eastbound left movement for traffic entering the post at the John J. Kingman Road Gate for the proposed improvements. Traffic was also added to the southbound movements for traffic exiting the post. A high amount of delay is currently experienced at the intersection of Fairfax County Parkway and Route 1 for the westbound right and southbound right movements during the PM peak. The construction of dual right turn lanes for the westbound right movement will increase the LOS for the movement to LOS A. This will decrease the total delay at the intersection; it will then operate at a LOS C during the PM peak. The widening of Route 1 to a six-lane divided highway will also increase the LOS for the eastbound through and westbound through movements at this intersection. It should also be noted that long range plans call for this

intersection to be changed to an interchange design, which should also improve the LOS. These improvements are necessary due to external growth and are not due to any changes on Fort Belvoir.

Table33. Fairfax County Parkway and Route 1 (2007)						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
AM Peak (LOS)	C	F	C	A	F	A
PM Peak (LOS)	D	A	F	F	E	F

This intersection is predicted to operate at a LOS C during the AM peak and at a LOS B during the PM peak of 2007 (Table34). Although the northbound through and southbound through movements experience a LOS E, the number of vehicles making these movements is very small. Due to the increased security, Beulah Street was closed to the south of this intersection, although a few vehicles were detected in the counts provided to Woolpert by VDOT.

Table34. Telegraph Road and Beulah Street (2007)												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
AM Peak (LOS)	A	D	A	A	A	A	D	E	A	D	E	D
PM Peak (LOS)	B	A	A	A	B	A	B	C	A	B	C	B

This intersection is predicted to operate at a LOS F during the AM and PM peak periods of 2007 (see Table35). The analysis was done assuming that the traffic signals are coordinated for the east-west movement through the interchange. The LOS should be reevaluated now that the construction in the area is complete.

Table335. Telegraph Road and Ramps A and B (2007)						
Movement	EBL	EBT	WBT	WBR	NBL	NBR
AM Peak (LOS)	A	F	A	A	E	F
PM Peak (LOS)	A	F	A	A	D	F

This intersection is predicted to operate at a LOS A during the AM and PM peak periods of 2007 (see Table36). The analysis was done assuming that the traffic signals are coordinated for the east-west movement through the interchange. The LOS should be reevaluated now that the construction in the area is complete.

Table36. Telegraph Road and Ramps C and D (2007)						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
AM Peak (LOS)	A	A	A	A	E	A
PM Peak (LOS)	A	A	A	A	D	B

Design Year 2007 No-Build Conditions

The roadway network around Fort Belvoir was also analyzed with the design year 2007 base traffic. That is the traffic that would be on the roadways in the year 2007 without any proposed improvements to the North Post of Fort Belvoir. The intersections along Route 1 and the Fairfax County Parkway were analyzed to determine if regional growth or the proposed

improvements cause the needed widening of these roadways. Tables 36 and 37 list the results of capacity analyses on the intersections along these corridors.

The intersection is predicted to operate at a LOS C during the AM peak period and at a LOS F during the PM peak period of 2007 (see Table37). The widening of the Fairfax County Parkway will be needed for this condition in the design year of 2007 to improve the LOS for the southbound through movements during the AM and PM peaks. This would also improve the LOS for the eastbound right movement during the PM peak. With the proposed widening of the Fairfax County Parkway all movements during both the AM and PM peaks would operate at a LOS C or better.

Table37. John J. Kingman Road and Fairfax County Parkway (2007 No-Build)											
Movement	EBL	EBT	EBR	WBL	WB TR	NBL	NBT	NBR	SBL	SBT	SBR
AM Peak (LOS)	D	D	A	D	D	D	A	A	B	D	A
PM Peak (LOS)	B	B	F	B	B	A	C	A	A	F	A

This intersection is predicted to operate at a LOS D during the AM peak period and at a LOS F during the PM peak period of the design year 2007 (see Table38). The widening of Route 1 is needed at this intersection for the design year no-build traffic conditions. With the widening of Route 1 to a six-lane section the intersection would operate at a LOS B during the AM peak period and at a LOS C during the PM peak period. The addition of dual right turn lanes at the westbound approach will also still be necessary.

Table38. Fairfax County Parkway and Route 1 (2007 No-Build)						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
AM Peak (LOS)	C	E	B	A	F	B
PM Peak (LOS)	B	A	F	F	E	F

The widening of the Fairfax County Parkway as well as the widening of Route 1 will be required for the design year 2007 no-build conditions. In other words the widening would be required if the proposed improvements to the North Post of Fort Belvoir were not constructed. Therefore it is reasonable to say that the need for the proposed widening comes from the growth of the surrounding region and not from the additional trips generated by the improvements to the North Post of Fort Belvoir.

Revised Hospital Plans

As this study has progressed, the relocated DeWitt Army Hospital has also been under design. Design plans have varied between 320,000 SF to 420,000 SF. The traffic generated by the proposed hospital was reevaluated based upon the most recent size of 418,000 SF. Using this square footage and the methodology described previously in the report, the hospital is expected to generate 7014 vpd, 405 vph in the AM peak, and 386 vph in the PM peak. Generated volumes are based on an average hospital as listed in the ITE Traffic Generation Manual. In keeping with the methodology from the rest of the report, the generated volumes were used in the analysis. Due to facility and technology improvements and the future construction of medical clinics in the surrounding region, travel patterns to and from the hospital may change. Therefore the analysis given below should adequately represent future traffic conditions. Any additional changes in the size of the hospital will be reflected in the Environmental Assessment for the hospital relocation project.

Capacity Analysis

Capacity analyses were performed for the design year 2007 build conditions based upon the revised trip generation data for the proposed hospital. The following tables indicate the results of the capacity analysis for this new condition.

Table 39. John J. Kingman Road and Gunston Road (2007 Revised Hospital)						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
AM Peak (LOS)	B	A	A	A	B	A
PM Peak (LOS)	B	A	B	B	B	A

This intersection (see table 39) will operate at a LOS A during the AM peak period and at a LOS B during the PM peak period under these conditions. The construction of a larger hospital than studied above, which generates more traffic, will not adversely affect the flow of traffic through this intersection.

Table 40. John J. Kingman Road and Beulah Street (2007 Revised Hospital)									
Movement	EBL	EBT	EBR	WBL	WB TR	NB TL	NBR	SB TL	SBR
AM Peak (LOS)	A	A	A	A	A	C	B	C	B
PM Peak (LOS)	A	C	A	A	A	B	A	B	A

This intersection (see table 40) will operate at a LOS A during the AM peak period and at a LOS B during the PM peak period under these conditions. The development of a larger hospital will not adversely affect the flow of traffic through this intersection. Several movements experience slightly higher delays at this intersection with the additional traffic, however all movements continue to experience LOS well above the accepted minimum.

Table 41. Gorgas Road and Gunston Road (2007 Revised Hospital)						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
AM Peak (LOS)	A	A	B	A	B	C
PM Peak (LOS)	B	B	C	B	B	B

This intersection (see table 41) will operate at a LOS B during both the AM and PM peak periods under these conditions. With the development of a larger hospital which will attract more trips several movements will experience slightly higher delays than under previous conditions. However, the flow of traffic through this intersection will not be adversely affected by the development of the larger hospital.

Table 42. Woodlawn Road and Gorgas Road (2007 Revised Hospital)										
Movement	EB TL	EBR	WB TL	WBR	NBL	NBT	NBR	SBL	SBT	SBR
AM Peak (LOS)	A	A	B	A	A	A	A	B	B	A
PM Peak (LOS)	B	A	B	A	A	A	A	A	B	A

This intersection (see table 42) is predicted to operate at a LOS A for both the AM and PM peak periods under these conditions. All movements at this intersection will enjoy high LOS for both peaks. The construction of a larger hospital will not adversely affect the flow of traffic through this intersection.

Table 43. Woodlawn Road and Route 1 (2007 Revised Hospital)						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
AM Peak (LOS)	E	C	E	A	F	A
PM Peak (LOS)	F	C	F	A	F	B

This intersection (see table 43) is predicted to operate at a LOS D during the AM peak period and at a LOS E during the PM peak period under these conditions. Several movements at these intersection experience higher amounts of delay under these conditions than were experienced under the smaller hospital conditions. These movements include the eastbound left movement, the eastbound through movement, the westbound through movement, and the southbound left movement. No additional improvements other than those listed above will be needed to serve the additional traffic generated by the larger hospital.

Table 44. John J. Kingman Road and Fairfax County Parkway (2007 Revised Hospital)											
Movement	EBL	EBT	EBR	WBL	WB TR	NBL	NBT	NBR	SBL	SBT	SBR
AM Peak (LOS)	D	D	A	F	A	E	B	A	B	D	A
PM Peak (LOS)	B	B	F	D	A	E	D	A	B	F	A

This intersection (see table 44) is predicted to operate at a LOS D during the AM peak period and at a LOS E during the PM peak period under these conditions. Some additional delay due to the larger hospital is experienced at this intersection. No additional improvements beyond those listed above will be necessary to serve the additional traffic generated by the larger hospital.

Table 45. Fairfax County Parkway and Route 1 (2007)						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
AM Peak (LOS)	B	E	C	A	F	B
PM Peak (LOS)	A	B	F	F	E	F

This intersection (see table 45) is predicted to operate at a LOS D during the AM peak period and at a LOS F during the PM peak period under these conditions. No additional improvements will be needed beyond those listed above in order serve the additional traffic generated by the larger hospital.

The additional intersections listed in the above sections should operate in the same manner as listed above with the smaller hospital. These intersections are far enough from the proposed hospital site that any increases in traffic caused by the larger hospital would cause additional delays that are insignificant.

Conclusions

All intersections located within the North Post of Fort Belvoir which were a part of this study currently experience a high LOS with little delay. However, it should be noted that the low volumes counted are due to the post being at force protection condition Charlie during the week of December 3, 2001. The intersections of John J. Kingman Road and Gunston Road, John J. Kingman Road and Beulah Street, and Gorgas Road and Woodlawn road all currently operate at a LOS A during both the AM and PM peaks. The intersection of Route 1 and Woodlawn road operates at a LOS A during the AM peak and at a LOS B during the PM peak.

Opening Day 2007 Priorities

All intersections located within the North Post of Fort Belvoir will continue to experience a high LOS through 2007, after the hospital opens. The intersections of John J. Kingman Road and Gunston Road, John J. Kingman Road and Beulah Street, Gorgas Road and Gunston Road, and Woodlawn Road and Gorgas Road will all operate at a LOS of B or better during the design year 2007 peak flows. All movements at these intersections will experience a LOS of C or better. It should be noted that there may be cumulative traffic impacts due to additional projects that are planned for the North Post of Fort Belvoir that are not in the subarea. These impacts will be identified in the individual NEPA documentation that will be prepared for each project. Mitigation measures will be developed and implemented for the specific impacts identified.

The intersection of Gunston Road and Gorgas Road will need to be signalized to accommodate 2007 traffic volumes at an acceptable LOS.